

**Table 4-15** 2030 Mobile Source Regional Transportation Pollutant Burdens (kg/day)

Alternative	Emission Burden (kg/day)					Percent Change from No Build				
	VOC	CO	NO <sub>x</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	VOC	CO	NO <sub>x</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>
No Build	6,874	147,899	4,856	376	175	n/a	n/a	n/a	n/a	n/a
Project	6,561	142,098	4,661	360	167	-4.6%	-3.9%	-4.0%	-4.3%	-4.6%

n/a = not applicable

Table 4-15 shows the results of the analysis of VOC, CO, NO<sub>x</sub>, PM<sub>10</sub>, and PM<sub>2.5</sub> for the Project compared to the No Build Alternative. If the electricity used to operate the Project is generated by combustion, this may produce additional emissions. However, these emissions will be offset in whole or part by the reductions generated by reduced VMT, as indicated in Table 4-15. Furthermore, power plant emissions may be more easily controlled than emissions from individual automobiles.

The Project is expected to have a small positive effect on MSAT emissions in the study corridor, compared to the No Build Alternative because of the reduction of VMT. MSAT levels could be higher in some locations in the study corridor than others, but current tools and science are not adequate to quantify these levels. However, EPA's vehicle and fuel regulations coupled with fleet turnover will result in lower region-wide MSAT levels from current levels.

The Project is predicted to demonstrate a 4-percent reduction in VMT and no change in overall network speed compared to the No Build Alternative. This will result in predicted pollution reductions ranging from 3.9 to 4.6 percent compared to the No Build Alternative.

#### Greenhouse Gases

The Project will decrease greenhouse gas emissions from transportation sources on O'ahu. Approximately 70 kg of carbon dioxide is emitted per million British thermal units (BTU) consumed when fuel oil, diesel, or gasoline is combusted (USDOE 2009). As detailed in Section 4.11, total

daily transportation energy consumption on O'ahu would be 94,890 million BTUs for the No Build Alternative and will be 92,450 million BTUs for the Project. Assuming all electricity is generated from combustion of oil, the daily 2,440-million-BTU energy savings will result in a daily reduction in greenhouse gas emissions of approximately 171 metric tons of carbon dioxide.

#### Local Effects

The study corridor is currently in attainment for CO, and monitored CO values are less than 20 percent of the applicable NAAQS. Therefore, no violations of the applicable NAAQS are likely to occur with the Project. As a result, a microscale CO analysis was not conducted.

#### Mitigation

Because no substantial air quality impacts are anticipated to result from operation of the Project, mitigation will not be required.

## 4.10 Noise and Vibration

This section describes the Project's effects on environmental noise and vibration levels in the study corridor. For more information and references, see the *Honolulu High-Capacity Transit Corridor Project Noise and Vibration Technical Report* (RTD 2008f) and the *Honolulu High-Capacity Transit Corridor Project Addendum 01 to the Noise and Vibration Technical Report* (RTD 2009a).

### 4.10.1 Background and Methodology

#### Background

Environmental noise is composed of many frequencies, each occurring simultaneously at its own sound pressure level. The range of magnitude, from the faintest to the loudest sound the ear can hear, is so large that sound pressure is expressed on a logarithmic scale in units called decibels (dB). The commonly used frequency weighting for environmental noise is A-weighting (dBA), which simulates how an average person hears sound.

A common noise descriptor for environmental noise is the equivalent sound level (Leq). Leq is a measure of total noise—a summation of all sounds during a period of time. Leq measured over a one-hour period is the hourly Leq [Leq(h)]. The day/night noise level (Ldn) is a descriptor of the

daily noise environment, which incorporates a penalty for high noise levels at night. Lmax is the maximum noise level during an event. Ldn is used by the EPA and FTA to evaluate noise levels in residential areas.

Typical sound levels experienced in urban environments are shown in Figure 4-51.

Noise from rail transit operations is generated from the interaction of wheels on track, motive power, and the operation of traction power substations. The interaction of steel wheels on rails generates the following three different types of noise, depending on track work: (1) noise generated by pass-by trains operating on tangent track sections, (2) noise generated from wheel squeal on tightly curved track, and (3) noise generated on special trackway sections, such as at crossovers or turnouts.

#### Noise Terminology

**dBA** is an A-weighted decibel, a measure that considers how people hear sound

**Lmax** is the maximum noise level during an event

**Leq** measures the average sound energy over time

**Ldn** is the day/night sound level, a 24-hour average with a penalty that makes sounds at night more important

#### Noise Criteria for the Project

Noise impacts from transit projects are evaluated using criteria established by the FTA, which are based on community reaction to environmental noise exposure (FTA 2006a). The FTA noise impact criteria group noise-sensitive land uses into the categories shown in Table 4-16.

Relative Sound Level	$\frac{1}{2}$ as loud		Baseline		Twice as loud		Four times as loud
Typical Sound Environment	Indoor Office		Urban Residential		Urban Commercial		
Lmax of Common Noise Sources		Washing Machine (3 ft)	Auto (50 mph at 50 ft)	Vacuum Cleaner (3 ft)	Garbage Disposal (3 ft)	Delivery Truck (50 mph at 50 ft)	Dump Truck (50 mph at 50 ft) Blender (3 ft)
Sound Level dBA	60	65	70	75	80	85	90
Lmax at 50 ft of Transit Noise Source		Rail Transit with a Barrier (50 mph)		Rail Transit City Bus (50 mph) (50 mph)			

Sources: EPA 1971, EPA 1974, FTA 2006

Figure 4-51 Typical Sound Levels



**Table 4-16** FTA Transit Project Noise Impact Criteria—Land Use Categories

Category	Metric	Land Use Description
1	Leq(h) (dBA)	Tracts of land where quiet is an essential element in their intended purpose. This category includes lands set aside for serenity and quiet, land uses such as outdoor amphitheaters and concert pavilions, and National Historic Landmarks with substantial outdoor use.
2	Ldn (dBA)	Residences and buildings where people normally sleep. This category includes homes, hospitals, and hotels where a nighttime sensitivity to noise is assumed to be of utmost importance.
3	Leq(h) (dBA)	Institutional land uses with primary daytime and evening use. This category includes schools, libraries, and churches where it is important to consider interference with such activities as speech, meditation, and concentration on reading material. Buildings with interior spaces where quiet is important, such as medical offices, conference rooms, recording studios, and concert halls, fall into this category. It also includes places for meditation or study associated with cemeteries, monuments, and museums. Certain historical sites, parks, and recreational facilities are also included.

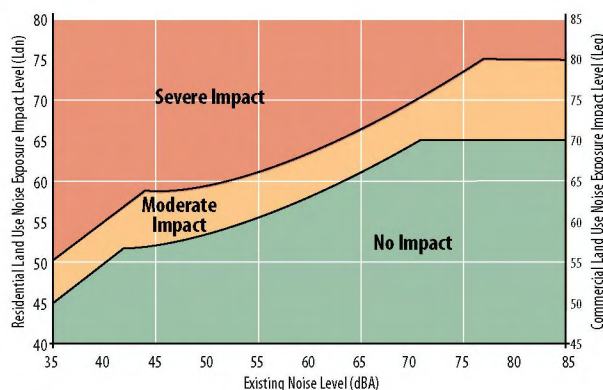
Source: Transit Noise and Vibration Impact Assessment, Final Report (FTA 2006a).

The FTA criteria define moderate and severe impacts. The project-generated noise level (project noise exposure) at which an impact will occur depends on the existing noise environment and the category of land use. The noise impact criteria for transit operations are shown on [Figure 4-52](#), with residential noise impacts (measured in Ldn) shown on the left side of the graph and commercial noise impacts (measured in Leq[h]) shown on the right. Reading from the graph, if the existing noise level in a residential area is 60 dBA Ldn, then a project that generates less than 58 dBA Ldn will not have an effect. If it generates between 58 and 63 dBA Ldn, it will cause a moderate impact, and if it generates more than 63 dBA Ldn, it will cause a severe impact. Future noise exposure is the combination

of existing noise exposure and the additional noise exposure caused by a project.

Severe noise impacts are considered significant within the context of NEPA and HRS 343. Severe noise impacts require the evaluation of alternative locations/alignments to avoid severe impacts altogether. If it is not practical to avoid severe impacts by changing the location of the Project, mitigation measures must be considered and incorporated into the Project unless there are truly extenuating circumstances that prevent it. Moderate noise impacts also require consideration and adoption of mitigation measures when it is reasonable. The mitigation of moderate impacts should consider the predicted increase over existing noise levels, the type and number of noise-sensitive land uses affected, existing outdoor/indoor sound insulation, community views, special protection provided by law, and the cost-effectiveness of mitigating noise to more acceptable levels.

The State of Hawai'i regulates community noise pollution through HAR 11-46. The regulations are applicable to stationary noise sources, such as traction power substations and the vehicle maintenance and storage facility.

**Figure 4-52** FTA Transit Project Noise Exposure Impact Criteria

### Vibration Criteria for the Project

Vibration effects from transit operations are generated by motions/actions at the wheel/rail interface. The smoothness of these motions/actions are influenced by wheel and rail roughness, transit vehicle suspension, train speed, track construction (including types of fixation and ballast), location of switches and crossovers, and the geologic strata (layers of rock and soil) underlying the track. Vibration from a passing train has the potential to move through the geologic strata, resulting in vibration transferred through the building foundation. The principal concern is annoyance to building occupants.

Ground-borne vibration is usually characterized in terms of vibration velocity. This is because—over the frequency range relevant to ground-borne vibration (about 1 to 200 hertz)—both human and building response tends to be more proportional to velocity than to displacement or acceleration. Vibration velocity is often reported as vibration decibels (VdB) relative to a reference velocity of  $10^{-6}$  inches/second.

The FTA has developed criteria for acceptable levels of ground-borne vibration (FTA 2006a) as shown in Table 4-17.

### Noise and Vibration Assessment Methodology

Project-related noise levels were calculated using FTA reference sound levels for rail transit.

Potentially noise-sensitive land uses and vibration-sensitive buildings were identified, as well as appropriate locations for noise monitoring.

Ground-level noise levels were measured at locations along the project alignment and near proposed station locations to establish the most sensitive existing environment (i.e., existing baseline noise levels). Noise levels were also measured on the upper floors of residential buildings that have four or more floors. This is done by performing a series of measurements at representative locations. All noise measurements were made in accordance with American National Standards Institute procedures for community noise measurements.

Noise measurements were taken at 46 noise-sensitive locations along the study corridor. Eight of the noise measurements were taken at sites near the Arizona Memorial and Pearl Harbor Naval Base in response to comments received on the Draft EIS. Measurements for 24-hour periods were conducted at 25 sites that include residences and other buildings where people normally sleep (Category 2 sites). These measurement locations were supplemented with short-term 15-minute measurement sites to determine existing noise levels at typical recreational, institutional, and commercial land uses with primarily daytime and evening activity (Category 3 sites). Eight of the 24-hour measurement sites were located on the upper floors of multi-story

Table 4-17 FTA Ground-borne Vibration Impact Criteria

Land Use Category	Ground-borne Vibration Impact Levels (VdB)	
	Frequent Events <sup>1</sup>	Infrequent Events <sup>2</sup>
Category 1: Buildings where low ambient vibration is essential for interior operations	65 VdB <sup>3</sup>	65 VdB <sup>3</sup>
Category 2: Residences and buildings where people normally sleep	72 VdB	80 VdB
Category 3: Institutional land uses with primarily daytime use	75 VdB	83 VdB

Source: *Transit Noise and Vibration Impact Assessment, Final Report (FTA 2006a)*.

<sup>1</sup> Frequent Events are defined as over 70 vibration events per day.

<sup>2</sup> Infrequent Events are defined as less than 70 vibration events per day. This includes most commuter rail systems.

<sup>3</sup> This criterion is based on levels that are acceptable for most moderately sensitive equipment, such as optical microscopes. Vibration-sensitive manufacturing or research will require detailed evaluation to define acceptable vibration levels. Ensuring lower vibration levels in a building often requires special design of the HVAC system and stiffened floors.



residential buildings with open lanais. Potential noise effects from transit park-and-ride lots and maintenance and storage facility operations were also identified.

Noise effects from the Project were determined by comparing the project-generated noise exposure level at each representative receptor in the corridor to the appropriate FTA criterion, given the land use and existing noise levels. If the project-generated noise is below the level for moderate impact, no impact will occur. If the noise level is between the level for moderate impact and severe impact, a moderate impact will occur. If the project noise level is equal to or above the severe impact level, a severe impact will occur.

Vibration effects from the Project were determined using the detailed vibration assessment information and procedures contained in the FTA's *Guidance Manual for Transit Noise and Vibration Impact Assessment* (FTA 2006a). FTA reference levels for a transit vehicle and FTA reference data on ground transmission of vibration energy were used to estimate vibration levels at distance from the fixed guideway.

#### 4.10.2 Affected Environment

This section describes the noise survey used to establish baseline conditions. Ambient vibration levels were not measured as part of this study.

##### ***Ambient Noise Conditions in the Study Area***

The measurement locations and existing sound levels are shown in Figures 4-53 through 4-56. These locations represent noise-sensitive land uses along the corridor.

##### ***Ambient Vibration Conditions in the Study Area***

Ambient vibration levels were not measured as part of this study but are anticipated to be below perceptible levels.

#### 4.10.3 Environmental Consequences and Mitigation

##### ***Environmental Consequences***

###### ***No Build Alternative***

Under the No Build Alternative, the Project would not be built and the only source of future noise levels would be traffic movements on local streets and highways. The Project would not generate any new noise impacts. Similarly, no new vibration sources would occur in the absence of the Project. Although the projects in the ORTP will be built, their environmental impacts will be studied in separate documents.

###### ***Project***

###### ***Noise***

The Project will include an integrated parapet wall at the edge of the guideway structure that extends 3 feet above the top of the rail.

Figures 4-53 through 4-56 show the measured existing noise level and future project noise exposure at each site. The data table included in these figures for each site is labeled “no impact” or “moderate impact” for each site. There will be three residential buildings that will experience adverse noise effects. No noise impacts will occur for schools, public parks, or historic resources as a result of the Project. There will be no noise impacts at the three sites located at the Arizona Memorial (Figure 4-55).

The Project will cause no severe noise impacts. Moderate impacts will occur at eight areas (Table 4-18). The moderate impacts to these eight areas will occur at the ground level for 50 residences and between the fifth and eleventh floors of four high-rise buildings.

The greatest noise source from the traction power substations will be air-conditioning equipment, which will not generate substantial noise impacts. Project park-and-ride lots will be located in undeveloped or commercial areas. The closest

**Table 4-18 Noise Impacts**

Area	Receptor Description	Buildings Affected	Level of Impact
West Loch to Waipahu Transit Center	94-340 Pupumomi Street	One 9-floor building	Moderate impact to 5th floor and above
West Loch to Waipahu Transit Center	Hanewai Circle	20 single-family residential	Moderate impact
Waipahu Transit Center to Leeward Community College	Awaiki Place	18 single-family residential	Moderate impact
Aloha Stadium to Pearl Harbor Naval Base	Betio Place	8 single-family residential	Moderate impact
Aloha Stadium to Pearl Harbor Naval Base	Makalapa Guest House	4 single-family residential	Moderate impact
Downtown to Civic Center	700 Richards Street	One 26-floor building	Moderate impact to 7th through 11th floors
Civic Center to Kaka'ako	860 Halekauwila	One 30-floor building	Moderate impact to 6th floor and above
Kaka'ako to Ala Moana Center	1133 Waimanu	One 28-floor building	Moderate impact to 5th through 9th floors

proximity from a park-and-ride lot to a residential use will be approximately 300 feet to the nearest point and more than 1,000 feet to the center of the park-and-ride site at Pearl Highlands.

Noise sources at the maintenance and storage facility will include trains operating and switching within the facility and maintenance and cleaning activities. These activities will occur over a 24-hour period. The Preferred Alternative for the maintenance and storage facility is a 44-acre vacant site in Waipahu near Leeward Community College. Leeward Community College and Waipahu High School are both approximately 700 feet from the center of the Leeward Community College site. At this distance, the maintenance activities will not generate substantial noise impacts. There are no noise-sensitive uses near the alternative Ho'opili maintenance site option.

#### ***Vibration***

Vibration levels at adjacent properties will not exceed 65 VdB for the elevated rail transit. This level is less than the FTA criterion of 72 VdB for residential buildings and other structures where people normally sleep (Category 2). No land use along the alignment is identified as having vibration-sensitive equipment that will require the

use of lower vibration impact criteria; therefore, no vibration effects are anticipated. No long-term vibration impacts will occur to historic resources.

#### ***Mitigation***

##### ***Noise***

Without mitigation, noise exposure levels at eight locations would exceed the noise impact criteria. Several measures are available to reduce noise levels during operation. Wheel skirts can reduce noise by as much as 10 dBA and track ballast by up to 5 dBA (FTA 2006).

For the Project, wheel skirts will reduce noise generated from the Project by 3 dBA or more. Wheel skirts have been added to the system specifications. As a result, noise exposure levels from the Project will be 3 dBA less than shown in Figures 4-53 through 4-56. Wheel skirts will reduce noise exposure levels to below the impact criteria at five of the eight locations where impacts are predicted (Table 4-19). With wheel skirts, three residential sites still will experience moderate noise impacts on the fifth through eleventh floors. The moderate noise impact that will occur at the high-rise buildings will only be experienced from units above track level on the fifth through ninth floors.

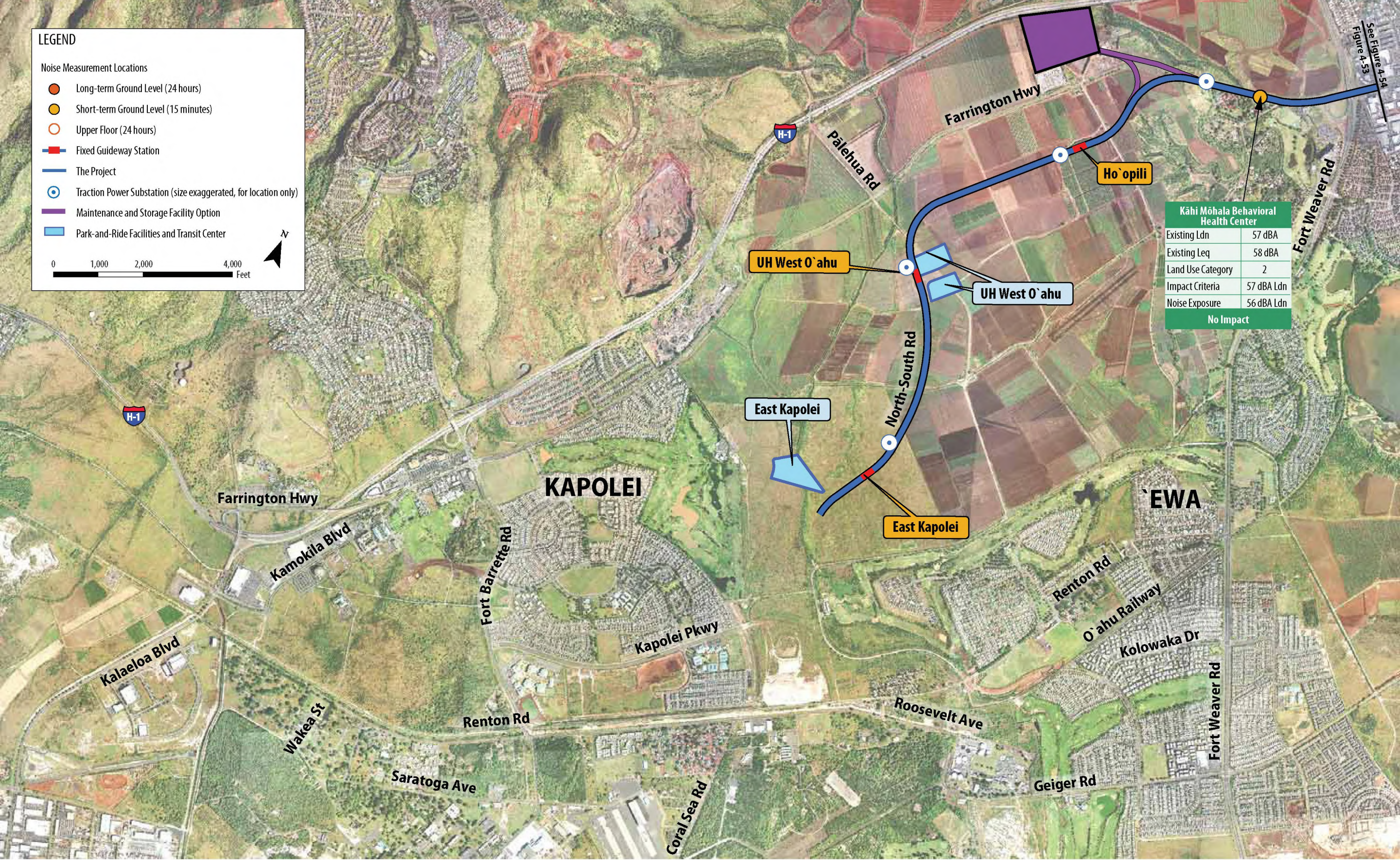


LEGEND

Noise Measurement Locations

- Long-term Ground Level (24 hours)
- Short-term Ground Level (15 minutes)
- Upper Floor (24 hours)
- Fixed Guideway Station
- The Project
- Traction Power Substation (size exaggerated, for location only)
- Maintenance and Storage Facility Option
- Park-and-Ride Facilities and Transit Center

0 1,000 2,000 4,000 Feet



Kāhi Mōhala Behavioral Health Center	
Existing Ldn	57 dBA
Existing Leq	58 dBA
Land Use Category	2
Impact Criteria	57 dBA Ldn
Noise Exposure	56 dBA Ldn
No Impact	

See Figure 4-54  
Figure 4-53





1060 Kamehameha Highway (2nd floor and above)	
Existing Ldn	67 dBA
Land Use Category	2
Impact Criteria	63 dBA Ldn
Noise Exposure	59 dBA Ldn
No Impact	

1060 Kamehameha Highway	
Existing Ldn	67 dBA
Existing Leq	68 dBA
Land Use Category	2
Impact Criteria	63 dBA Ldn
Noise Exposure	59 dBA Ldn
No Impact	

310 Kamehameha Highway (3rd floor)	
Existing Ldn	74 dBA
Land Use Category	2
Impact Criteria	66 dBA Ldn
Noise Exposure	64 dBA Ldn
No Impact	

Leeward Community College	
Existing Leq	65 dBA
Land Use Category	3
Impact Criteria	66 dBA Leq
Noise Exposure	59 dBA Leq
No Impact	

94-1041 Kahuamoku Boulevard (4th floor)	
Existing Ldn	70 dBA
Land Use Category	2
Impact Criteria	65 dBA Ldn
Noise Exposure	62 dBA Ldn
No Impact	

Leeward Community College	
Existing Ldn	69 dBA
Existing Leq	67 dBA
Land Use Category	2
Impact Criteria	63 dBA Ldn
Noise Exposure	60 dBA Ldn
No Impact	

751 Pu'u Kala Street	
Existing Ldn	67 dBA
Existing Leq	68 dBA
Land Use Category	2
Impact Criteria	63 dBA Ldn
Noise Exposure	59 dBA Ldn
No Impact	

Neal S. Blaisdell Park	
Existing Leq	64 dBA
Land Use Category	3
Impact Criteria	66 dBA Leq
Noise Exposure	59 dBA Leq
No Impact	

94-309 Hanewai Circle	
Existing Ldn	63 dBA
Existing Leq	59 dBA
Land Use Category	2
Impact Criteria	60 dBA Ldn
Noise Exposure	60 dBA Ldn
Moderate Impact	

94-261 Kahualena Street	
Existing Ldn	69 dBA
Existing Leq	67 dBA
Land Use Category	2
Impact Criteria	63 dBA Ldn
Noise Exposure	60 dBA Ldn
No Impact	

Pacheco Neighborhood Park	
Existing Leq	59 dBA
Land Use Category	3
Impact Criteria	63 dBA Leq
Noise Exposure	58 dBA Leq
No Impact	

98-5 Kuleana Place	
Existing Ldn	74 dBA
Existing Leq	72 dBA
Land Use Category	2
Impact Criteria	66 dBA Ldn
Noise Exposure	62 dBA Ldn
No Impact	

98-124B Kihale Street	
Existing Ldn	74 dBA
Existing Leq	72 dBA
Land Use Category	2
Impact Criteria	66 dBA Ldn
Noise Exposure	62 dBA Ldn
No Impact	

99-002 'Le'le Street	
Existing Ldn	79 dBA
Existing Leq	81 dBA
Land Use Category	2
Impact Criteria	66 dBA Ldn
Noise Exposure	61 dBA Ldn
No Impact	

94-340 Pupumomi Street (5th floor and above)	
Existing Ldn	72 dBA
Land Use Category	2
Impact Criteria	66 dBA Ldn
Noise Exposure	71 dBA Ldn
Moderate Impact (Before Mitigation)	

94-979 Kahuamoku Place	
Existing Ldn	78 dBA
Existing Leq	80 dBA
Land Use Category	2
Impact Criteria	66 dBA Ldn
Noise Exposure	59 dBA Ldn
No Impact	

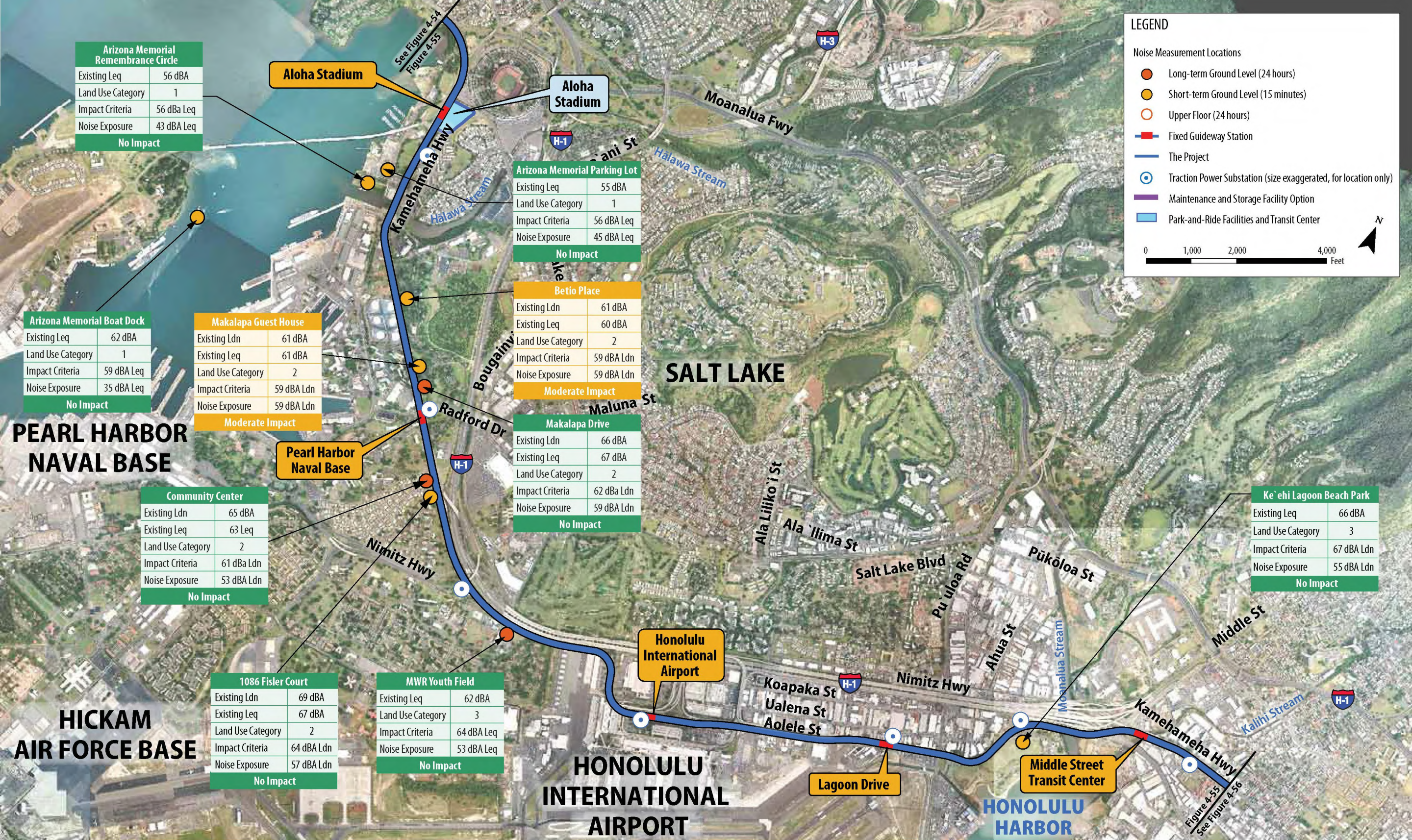
94-1041 Kahuamoku Place	
Existing Ldn	73 dBA
Existing Leq	72 dBA
Land Use Category	2
Impact Criteria	66 dBA Ldn
Noise Exposure	59 dBA Ldn
No Impact	

91-1144 Awaiki Place	
Existing Ldn	59 dBA
Existing Leq	55 dBA
Land Use Category	2
Impact Criteria	58 dBA Ldn
Noise Exposure	59 dBA Ldn
Moderate Impact	

94-508 Farrington Highway	
Existing Ldn	72 dBA
Existing Leq	69 dBA
Land Use Category	2
Impact Criteria	66 dBA Ldn
Noise Exposure	60 dBA Ldn
No Impact	

Waipahu Intermediate School	
Existing Leq	58 dBA
Land Use Category	3
Impact Criteria	62 dBA Leq
Noise Exposure	58 dBA Leq
No Impact	







Honolulu Community College	
Existing Leq	72 dBA
Land Use Category	3
Impact Criteria	71 dBA Leq
Noise Exposure	59 dBA Leq
No Impact	

215 King Street	
Existing Ldn	73 dBA
Existing Leq	72 dBA
Land Use Category	2
Impact Criteria	66 dBA Ldn
Noise Exposure	53 dBA Ldn
No Impact	

215 King Street (6th to 12th floors)	
Existing Ldn	73 dBA
Land Use Category	2
Impact Criteria	66 dBA Ldn
Noise Exposure	63 dBA Ldn
No Impact	

Fort Street Mall	
Existing Leq	67 dBA
Land Use Category	3
Impact Criteria	68 dBA Leq
Noise Exposure	56 dBA Leq
No Impact	

Aloha Tower Marketplace	
Existing Leq	63 dBA
Land Use Category	3
Impact Criteria	65 dBA Leq
Noise Exposure	55 dBA Leq
No Impact	

700 Richards Street (7th floor)	
Existing Ldn	76 dBA
Land Use Category	2
Impact Criteria	66 dBA Ldn
Noise Exposure	67 dBA Ldn
Moderate Impact	

1133 Waimanu Street (5th to 9th floors)	
Existing Ldn	75 dBA
Land Use Category	2
Impact Criteria	66 dBA Ldn
Noise Exposure	69 dBA Ldn

Moderate Impact  
(Before Mitigation)

1133 Waimanu Street  
(ground floor)

Existing Ldn	65 dBA
Existing Leq	67 dBA
Land Use Category	2
Impact Criteria	61 dBA Ldn
Noise Exposure	56 dBA Ldn
No Impact	

Wilder Ave

610 Cooke Street (5th floor)	
Existing Ldn	75 dBA
Land Use Category	2
Impact Criteria	66 dBA Ldn
Noise Exposure	64 dBA Ldn
No Impact	

1746 Dillingham Boulevard	
Existing Ldn	75 dBA
Existing Leq	73 dBA
Land Use Category	2
Impact Criteria	66 dBA Ldn
Noise Exposure	62 dBA Ldn
No Impact	

Harbor Village, 900 River Street	
Existing Ldn	77 dBA
Existing Leq	74 dBA
Land Use Category	2
Impact Criteria	66 dBA Ldn
Noise Exposure	58 dBA Ldn
No Impact	

Harbor Square 700 Richards Street	
Existing Ldn	76 dBA
Existing Leq	74 dBA
Land Use Category	2
Impact Criteria	66 dBA Ldn
Noise Exposure	59 dBA Ldn
No Impact	

Mother Waidron Neighborhood Park	
Existing Leq	58 dBA
Land Use Category	3
Impact Criteria	62 dBA Leq
Noise Exposure	56 dBA Leq
No Impact	

Na Lei Hulu Kupuna 610 Cooke Street	
Existing Ldn	67 dBA
Existing Leq	65 dBA
Land Use Category	2
Impact Criteria	63 dBA Ldn
Noise Exposure	60 dBA Ldn
No Impact	

860 Halekauwila Street (7th to 9th floors)	
Existing Ldn	75 dBA
Land Use Category	2
Impact Criteria	66 dBA Ldn
Noise Exposure	70 dBA Ldn
Moderate Impact (Before Mitigation)	

1341 Kapi'olani Boulevard (7th to 9th floors)	
Existing Ldn	75 dBA
Land Use Category	2
Impact Criteria	66 dBA Ldn
Noise Exposure	63 dBA Ldn
No Impact	

## LEGEND

### Noise Measurement Locations

- Long-term Ground Level (24 hours)
- Short-term Ground Level (15 minutes)
- Upper Floor (24 hours)
- Fixed Guideway Station
- The Project
- Traction Power Substation (size exaggerated, for location only)
- Maintenance and Storage Facility Option
- Park-and-Ride Facilities and Transit Center

0 1,000 2,000 4,000 Feet





**Table 4-19** Mitigated Noise Levels

Area	Receptor Description	Impact Criteria	Noise Level without Mitigation	Noise Level with Wheel Skirts	Noise Level with Wheel Skirts and Sound Absorptive Material
West Loch to Waipahu Transit Center	94-340 Pupumomi Street, 5th floor and above	66 dBA Ldn	71 dBA Ldn	68 dBA Ldn	65 dBA Ldn
West Loch to Waipahu Transit Center	Hanewai Circle	60 dBA Ldn	60 dBA Ldn	57 dBA Ldn	n/a
Waipahu Transit Center to Leeward Community College	Awaiki Place	58 dBA Ldn	59 dBA Ldn	56 dBA Ldn	n/a
Aloha Stadium to Pearl Harbor Naval Base	Betio Place	59 dBA Ldn	59 dBA Ldn	56 dBA Ldn	n/a
Aloha Stadium to Pearl Harbor Naval Base	Makalapa Guest House	59 dBA Ldn	59 dBA Ldn	56 dBA Ldn	n/a
Downtown to Civic Center	700 Richards Street, 7th through 11th floors	66 dBA Ldn	67 dBA Ldn	64 dBA Ldn	n/a
Civic Center to Kaka'ako	860 Halekauwila, 6th floor and above	66 dBA Ldn	70 dBA Ldn	67 dBA Ldn	64 dBA Ldn
Kaka'ako to Ala Moana Center	1133 Waimanu, 5th through 9th floors	66 dBA Ldn	69 dBA Ldn	66 dBA Ldn	63 dBA Ldn

Values in BOLD represent a noise impact

n/a – Not applicable, Sound Absorptive Material not proposed in this location.

The use of sound-absorptive materials under the tracks in these three areas will reduce the project noise exposure at upper floors to below the moderate noise impact threshold (Table 4-19). Eight hundred feet of sound-absorptive material will be installed from Pupukahi Street to Pupupuhi Street. For the building at 860 Halekauwila Street, sound-absorptive material will be required from 200 feet 'Ewa of Kamani Street to 100 feet Koko Head of Kamani Street—a total of 300 feet. The building at 1133 Waimanu will require sound-absorptive material to be installed between Kamakee Street and Waimanu Street for a total of 920 feet.

Once the Project is operating, noise measurements will be conducted at representative sites. Should the Project's noise exposure exceed the FTA noise impact criteria, further mitigation may be con-

ducted on the receivers with the authorization of the property owners.

#### **Vibration**

Because no vibration effects are projected, no mitigation is proposed.

## **4.11 Energy and Electric and Magnetic Fields**

This section describes the energy required for operating the Project and analyzes electric and magnetic fields (EMF) as related to the Project's operation. Energy used during the Project's operation will include fuel consumed by buses, electricity used to power transit vehicles, and a negligible amount of energy for signals, lighting, and maintenance. For more information and references, see the *Honolulu High-Capacity Transit*